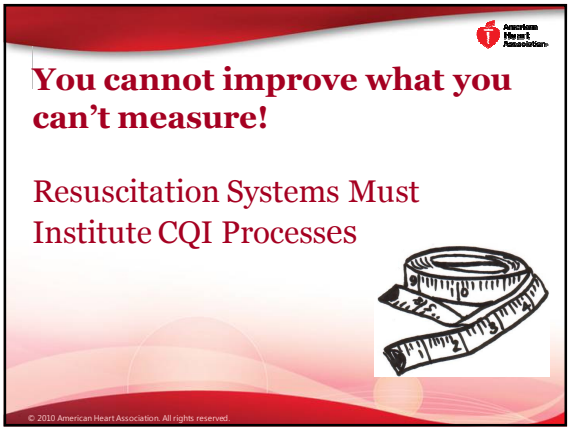
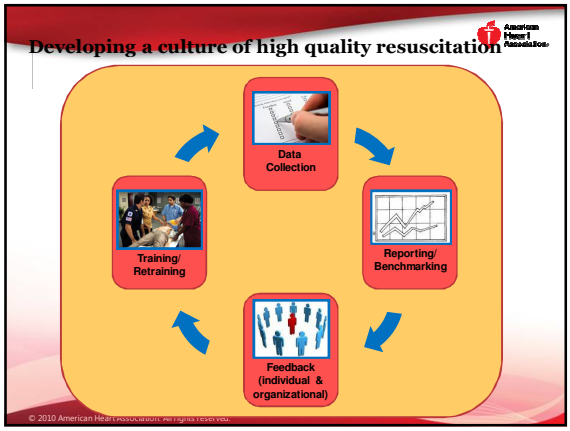
Answer: It's ALL Hot!

- System measurement
- Bystander CPR
- Dispatch-assisted CPR
- Improved Professional CPR Quality
- CPR-Defibrillation Interplay
- Mechanical CPR and Adjuncts
- Evolving Defibrillation Technologies
- VF Waveform Detection
- Cooling/PCI strategies and MORE!



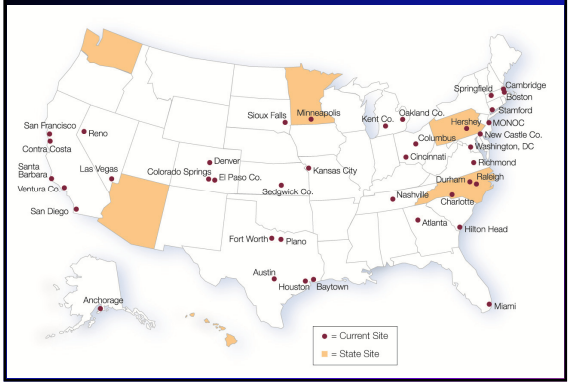


Domino's vs. EMS

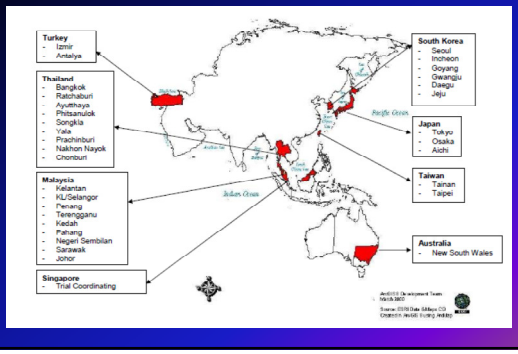
- Hungry?
  - 30 minutes call-to-door guaranteed.
  - Customer input for QI
  - Cost: $10.95 (plus tip)
- Cardiac Arrest?
  - Call-to-door time rarely tracked
  - No performance metrics, no QI
  - Cost: ***Priceless***

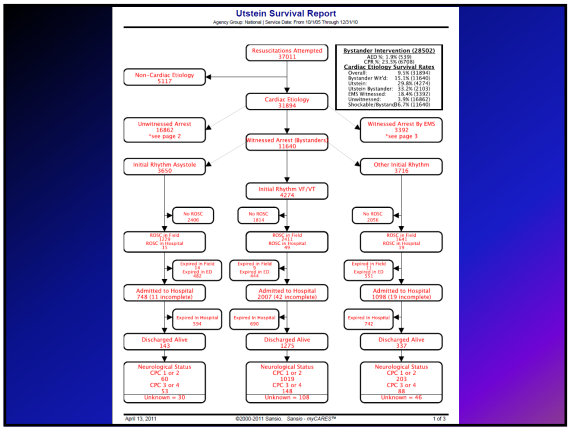
Dr. Angelo Salvucci, Ventura County, CA

CARES Current Site Map

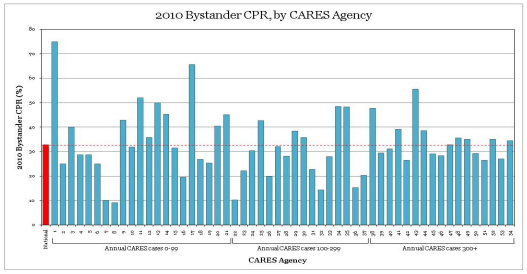


PAROS Participating Countries





National Bystander CPR Data

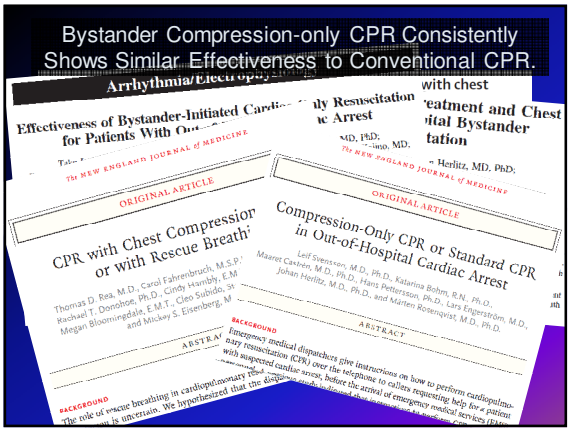


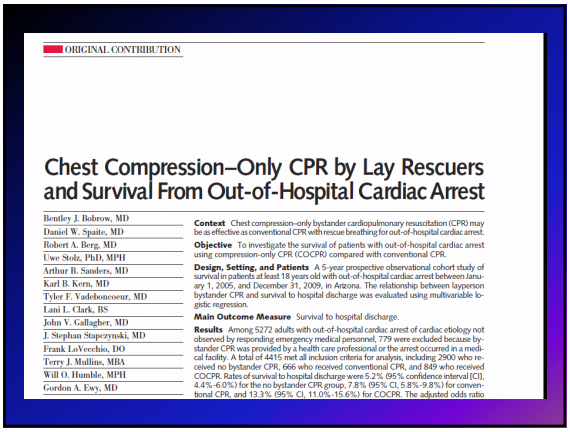
CARES Agency	National	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Number of CARES cases	11980	4	4	5	7	7	9	10	11	14	22	25	42	44	53	54	56	64	67	71	74	80	118	140	145	148	151

CARES Agency	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Number of CARES cases	156	164	175	179	180	189	209	235	245	248	290	300	314	330	338	344	358	368	373	385	394	404	458

CARES Agency	50	51	52	53	54
Number of CARES cases	460	491	539	618	1089

Bystander Compression-only CPR Consistently Shows Similar Effectiveness to Conventional CPR.




ORIGINAL CONTRIBUTION

Chest Compression–Only CPR by Lay Rescuers and Survival From Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD
Daniel W. Spaite, MD
Robert A. Berg, MD
Uwe Stolz, PhD, MPH
Arthur B. Sanders, MD
Karl B. Kern, MD
Tyler F. Vadeboncoeur, MD
Lani L. Clark, BS
John V. Gallagher, MD
J. Stephan Stapczynski, MD
Frank LoVecchio, DO
Terry J. Mullins, MBA
Will O. Humble, MPH
Gordon A. Ewy, MD

Context Chest compression–only bystander cardiopulmonary resuscitation (CPR) may be as effective as conventional CPR with rescue breathing for out-of-hospital cardiac arrest.

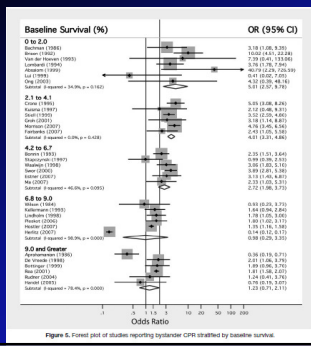
Objective To investigate the survival of patients with out-of-hospital cardiac arrest using compression-only CPR (COCPR) compared with conventional CPR.

Design, Setting, and Patients A 5-year prospective observational cohort study of survival in patients at least 18 years old with out-of-hospital cardiac arrest between January 1, 2005, and December 31, 2009, in Arizona. The relationship between layperson bystander CPR and survival to hospital discharge was evaluated using multivariable logistic regression.

Main Outcome Measure Survival to hospital discharge.

Results Among 5272 adults with out-of-hospital cardiac arrest of cardiac etiology not observed by responding emergency medical personnel, 779 were excluded because bystander CPR was provided by a health care professional or the arrest occurred in a medical facility. A total of 4415 met all inclusion criteria for analysis, including 2900 who received no bystander CPR, 666 who received conventional CPR, and 849 who received COCPR. Rates of survival to hospital discharge were 5.2% (95% confidence interval [CI], 4.4%-6.0%) for the no bystander CPR group, 7.8% (95% CI, 5.8%-9.8%) for conventional CPR, and 13.3% (95% CI, 11.0%-15.6%) for COCPR. The adjusted odds ratio

Great Importance of Bystander CPR



The OR for Bystander CPR was 2.44 (95% CI, 1.69-3.19)

(Sasson et. al. Circulation: Cardiovascular Quality and Outcomes Nov. 2009.)

Real Life Advantages to COCPR Approach:

- Simpler and faster to teach (brief media exposure)
- Easier to learn
- Easier to remember in an emergency
- Less complex psychomotor skill
- Lay rescuers *may* be more able/willing to only pump
- Dispatch can instruct more rapidly

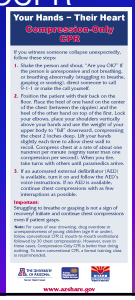
- *…..May* get more lay rescuers to simply ***ACT***

Objective:

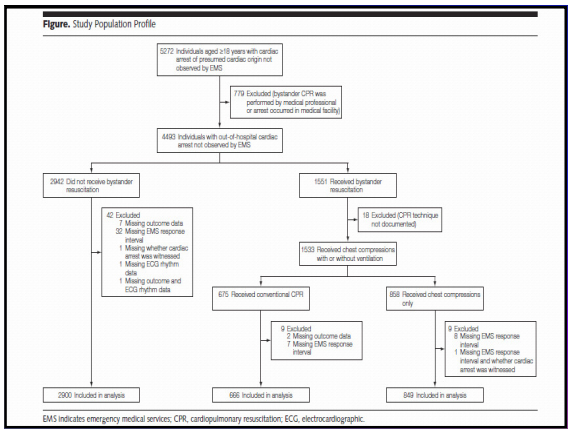
To compare survival using COCPR compared with conventional CPR in a setting where COCPR is formally and intentionally advocated for adults with sudden, unexpected collapse.

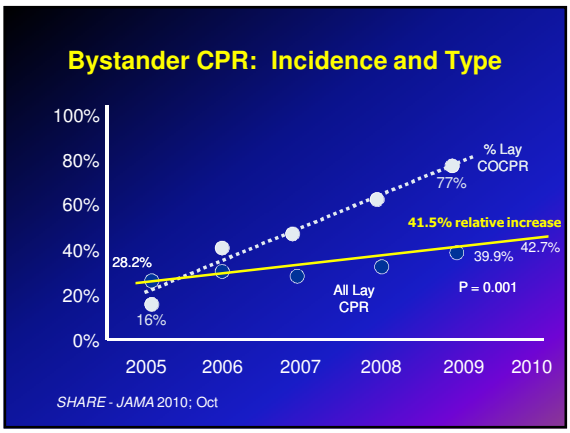
Interventions

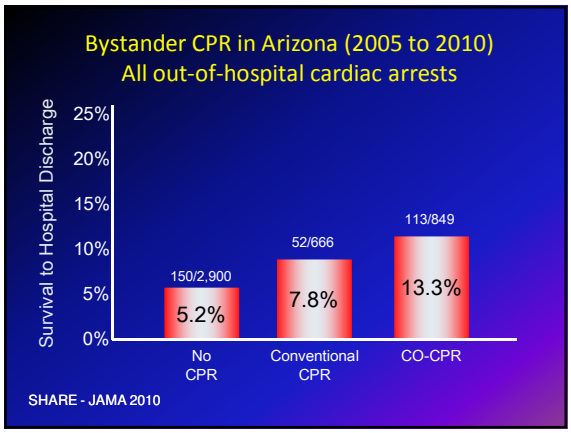
- In 2005 ADHS and the SHC initiated a statewide public COCPR campaign:
  - celebrity endorsements,
  - newspaper articles,
  - Radio, billboard and TV spots,
  - flyers sent to households in utility bills
  - No structured DA-CPR

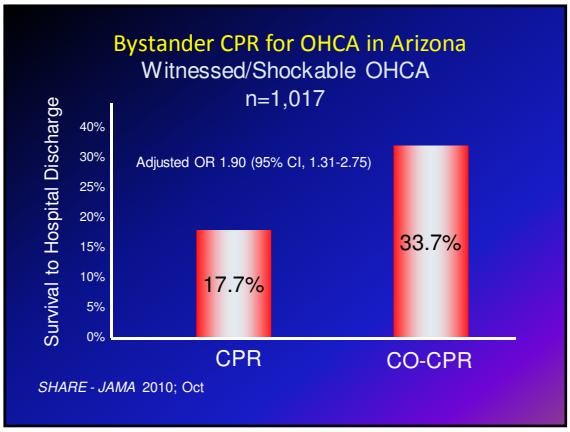


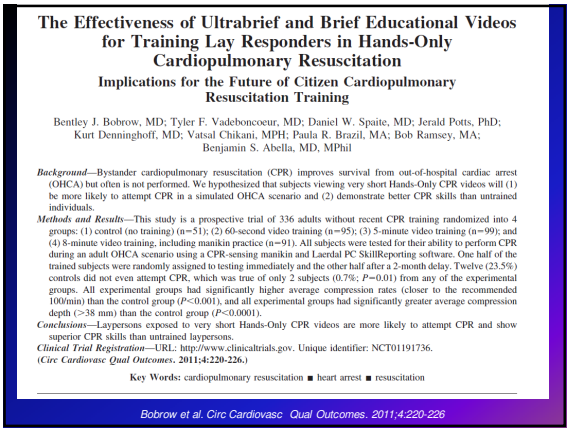
Brief PSAs with Governor and Celebs











The Effectiveness of Ultrabrief and Brief Educational Videos for Training Lay Responders in Hands-Only Cardiopulmonary Resuscitation

Implications for the Future of Citizen Cardiopulmonary Resuscitation Training

Bentley J. Bobrow, MD; Tyler F. Vadeboncoeur, MD; Daniel W. Spaite, MD; Jerald Potts, PhD; Kurt Denninghoff, MD; Vatsal Chikani, MPH; Paula R. Brazil, MA; Bob Ramsey, MA; Benjamin S. Abella, MD, MPhil

Background—Bystander cardiopulmonary resuscitation (CPR) improves survival from out-of-hospital cardiac arrest (OHCA) but often is not performed. We hypothesized that subjects viewing very short Hands-Only CPR videos will (1) be more likely to attempt CPR in a simulated OHCA scenario and (2) demonstrate better CPR skills than untrained individuals.

Methods and Results—This study is a prospective trial of 336 adults without recent CPR training randomized into 4 groups: (1) control (no training) (n=51); (2) 60-second video training (n=95); (3) 5-minute video training (n=99); and (4) 8-minute video training, including manikin practice (n=91). All subjects were tested for their ability to perform CPR during an adult OHCA scenario using a CPR-sensing manikin and Laerdal PC SkillReporting software. One half of the trained subjects were randomly assigned to testing immediately and the other half after a 2-month delay. Twelve (23.5%) controls did not even attempt CPR, which was true of only 2 subjects (0.7%; $P=0.01$) from any of the experimental groups. All experimental groups had significantly higher average compression rates (closer to the recommended 100/min) than the control group ($P<0.001$), and all experimental groups had significantly greater average compression depth (>38 mm) than the control group ($P<0.0001$).

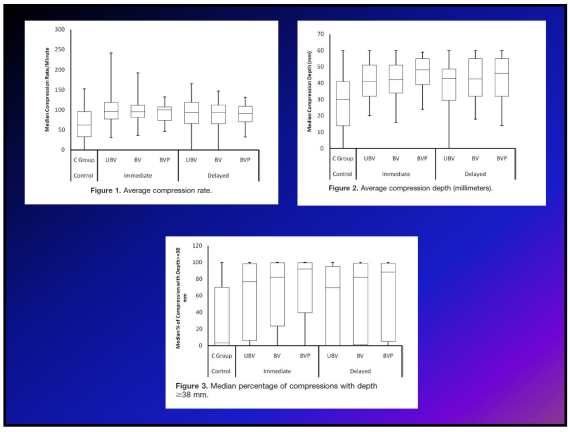
Conclusions—Laypersons exposed to very short Hands-Only CPR videos are more likely to attempt CPR and show superior CPR skills than untrained laypersons.

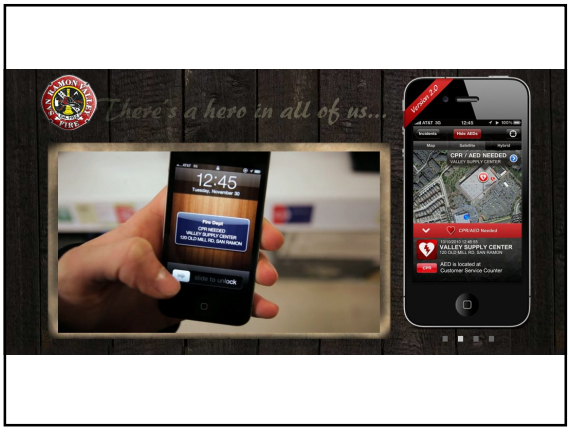
Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01191736.

(*Circ Cardiovasc Qual Outcomes*. **2011;4:220-226.**)

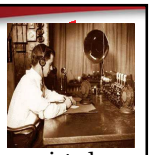
Key Words: cardiopulmonary resuscitation ■ heart arrest ■ resuscitation

Bobrow et al. Circ Cardiovasc Qual Outcomes. 2011;4:220-226





Dispatcher-assisted Hands-only CPR



RTCs: Outcomes as good with dispatcher-assisted hands-only CPR vs CC+RB CPR

Rea, NEJM 2010 Svennson NEJM 2010

Meta-analysis: Better survival with hands-only CPR

Hupfl Lancet 2010

Limitations

- Not an RCT – could not randomize this question
- Large, state-wide, observational study over long time period best method to evaluate
- Risk of ascertainment bias- however did not see this in all groups (54% lay vs. 8% trained rescuers)
- Difficult to quantify impact of intervention vs. ease of doing COCPR

CPR renaissance: measuring CPR

Interruptions of Chest Compressions During Emergency

Terence D. V
Marc D. Berg

Quality of Cardiopulmonary Resuscitation During Out-of-Hospital Cardiac Arrest

Lars Wik, MD, PhD
Jo Kramer-Johansen, MD

Context Cardiopulmonary resuscitation (CPR) guidelines recommend target values for compressions, ventilations, and CPR-free intervals allowed for rhythm analysis and

Quality of Cardiopulmonary Resuscitation

D

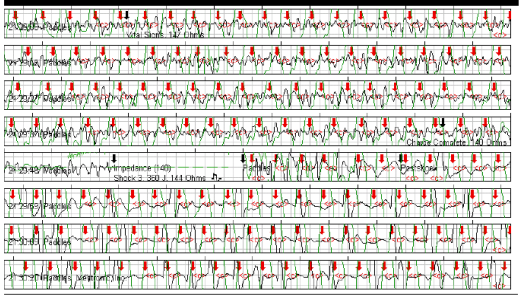
Hyperventilation-Induced Hypotension During Cardiopulmonary Resuscitation

Ben
Jas
Hel

Tom P. Aufderheide, MD; Gardar Sigurdsson, MD; Ronald G. Pirrallo, MD, MHSA; Demetris Yannopoulos, MD; Scott McKnite, BA; Chris von Briesen, BA, EMT; Christopher W. Sparks, EMT; Craig J. Conrad, RN; Terry A. Provo, BA, EMT-P; Keith G. Lurie, MD

Valenzuela et al, Circ 2005
Wik et al, JAMA 2005
Abella et al, JAMA 2005
Aufderheide et al,Circ 2004

Measuring CPR density



Improving EMS care with Minimizing Pauses

Minimally Interrupted Cardiac Resuscitation by Emergency Medical Services for Out-of-Hospital Cardiac Arrest

Bentley J. Bobrow, MD
Lani L. Clark, BS

Context Out-of-hospital cardiac arrest is a major public health problem.
Objective To investigate whether the survival of patients with out-of-hospital car-

Bobrow et al, 2008

Interventions:

1. **Significantly delay intubation**
2. **200 compressions before first shock**
3. **Minimize pre and post shock pauses**

Tripled survival to hospital discharge (3.8% → 9.1%)

CPR quality technologies

Manual CPR support devices

Zoll AED, R series

Philips MRx

Mechanical CPR devices

Zoll Autopulse

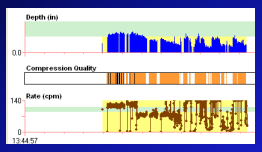
LUCAS

CPR sensing and recording defibrillator

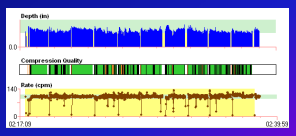
Similar defibrillators now made by both Philips and Zoll

Measurement of CPR Quality:

Typical code prior to training and technology implementation

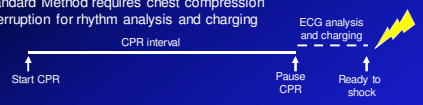


Example of a code after training and technology implementation

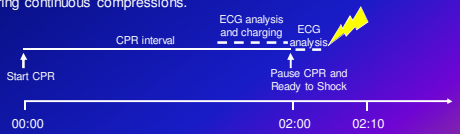


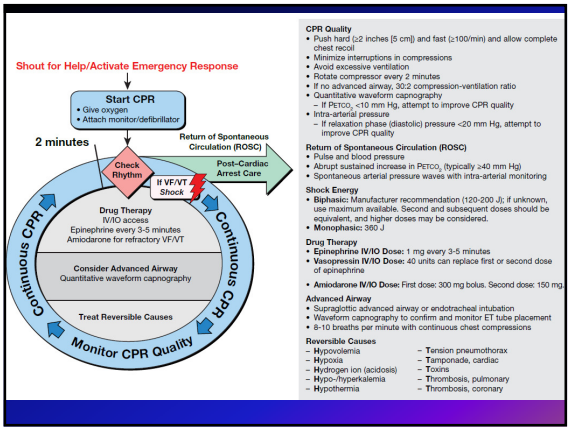
Minimizing Pauses Around Shock

a) Standard Method requires chest compression interruption for rhythm analysis and charging



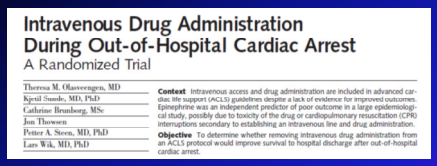
b) CPR Ready Charge limits interruptions through automated analysis and charging during continuous compressions.





The key importance of CPR

Reflected in the poor impact of ACLS meds:



Intravenous Drug Administration During Out-of-Hospital Cardiac Arrest
A Randomized Trial

Theresa M. Olasveengen, MD
Kjetil Sunde, MD, PhD
Cathrine Brunborg, MSc
Jon Thowsen
Petter A. Steen, MD, PhD
Lars Wik, MD, PhD

Context Intravenous access and drug administration are included in advanced cardiac life support (ACLS) guidelines despite a lack of evidence for improved outcomes. Epinephrine was an independent predictor of poor outcome in a large epidemiological study, possibly due to toxicity of the drug or cardiopulmonary resuscitation (CPR) interruptions secondary to establishing an intravenous line and drug administration.

Objective To determine whether removing intravenous drug administration from an ACLS protocol would improve survival to hospital discharge after out-of-hospital cardiac arrest.

2009

Randomized trial of epinephrine versus no epinephrine For EMS treated cardiac arrest → NO SURVIVAL BENEFIT!

Devices for CPR

- The impedance threshold device (ITD) may be considered by trained personnel as a CPR adjunct in adult cardiac arrest (Class IIb, LOE B).
- Insufficient evidence to support or refute the routine use of mechanical piston devices (e.g. LUCAS) in the treatment of cardiac arrest.
- Insufficient evidence to support the routine use of load distributing band device (e.g. AutoPulse) in treatment of cardiac arrest.

Autopulse data

Ong et al, 2006

Out-of-hospital, Richmond, VA (one site)

	Manual	Autopulse
ROSC	101/499 (20.2%)	96/278 (34.5%)
Admitted	54/485 (11.1%)	58/277 (20.9%)
D/C	14/486 (2.9%)	27/278 (9.7%)

Autopulse data: RCT

Hallstrom et al, 2006 (ASPIRE)

Out-of-hospital, multicenter RCT – US, Canada

	Manual	Autopulse
ROSC	92/373 (24.7%)	104/394 (26.4%)
D/C	37/373 (9.9%)	23/394 (5.8%)

The future: cooling during arrest?

Mild hypothermia during advanced life support: a preliminary study in out-of-hospital cardiac arrest

Cédric Bruel[1], Jean-Jacques Parienti[2], William Marie[1], Xavier Arrot[3], Cédric Daubin[1], Damien Du Cheyron[1], Massimo Massetti[4] and Pierre Charbonneau[1]

2008

Supported by animal data

Problem: how to cool rapidly enough?

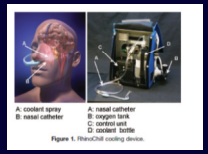
How to make it feasible?

The future of EMS cooling?

Intra-Arrest Transnasal Evaporative Cooling
A Randomized, Prehospital, Multicenter Study (PRINCE: Pre-ROSC IntraNasal Cooling Effectiveness)

Maaret Castrén, MD, PhD*; Per Nordberg, MD*; Leif Svensson, MD, PhD; Fabio Taccone, MD; Jean-Louise Vincent, MD, PhD; Didier Desmettes, MD; Frank Eichwede, MD; Pierre Meis, MD, PhD; Tilmann Schwab, MD; Michel Vergnion, MD; Christian Storm, MD; Antonio Pesenti, MD, PhD; Jan Pachl, MD, PhD; Fabien Guérisse, MD; Thomas Ebste, MD; Markus Roessler, MD, DEAA; Harald Fritz, MD; Pieterjan Dumez, MD; Hans-Jörg Busch, MD; Becky Inderbitzen, MSE; Denise Barbut, MD

2010



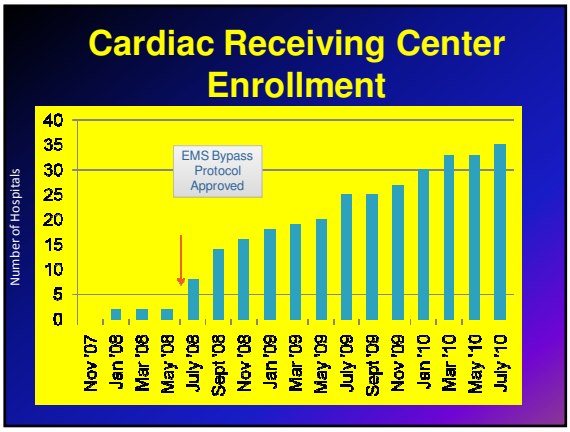
Trend towards improved outcomes using INTRA-ARREST cooling device –

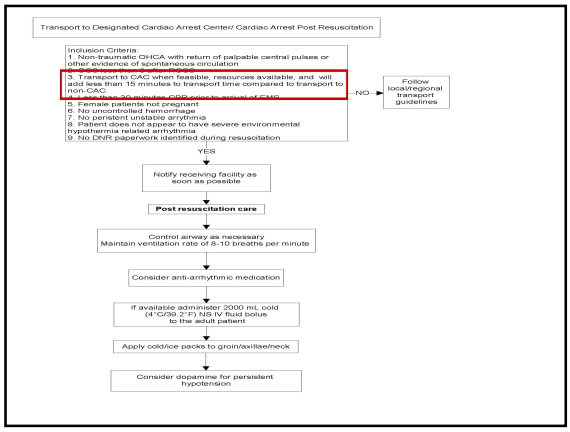
Will require larger RCT to confirm results

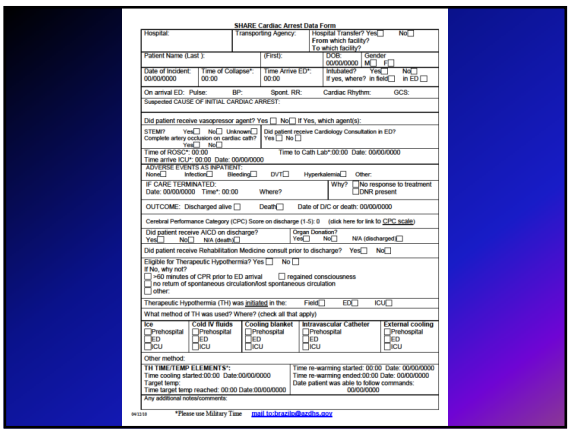
Prognostication after OHCA 2010 AHA Guidelines

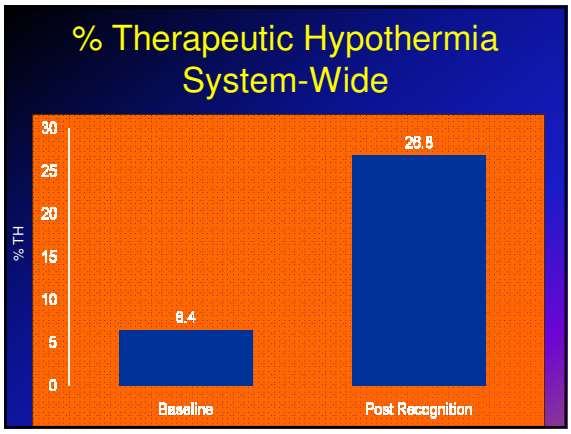
Changes in Prognostication With Hypothermia

There is a paucity of data about the utility of physical examination, EEG, and evoked potentials in patients who have been treated with induced hypothermia. Physical examination (motor response, pupillary light and corneal reflexes), EEG, SSEP, and imaging studies are less reliable for predicting poor outcome in patients treated with hypothermia. Durations of observation greater than 72 hours after ROSC should be considered before predicting poor outcome in patients treated with hypothermia (Class I, Level C).


Cardiac Receiving Center Enrollment
Number of Hospitals
40
35
30
25
20
15
10
5
0
EMS Bypass Protocol Approved
Nov '07
Jan '08
Mar '08
May '08
July '08
Sept '08
Nov '08
Jan '09
Mar '09
May '09
July '09
Sept '09
Nov '09
Jan '10
Mar '10
May '10
July '10

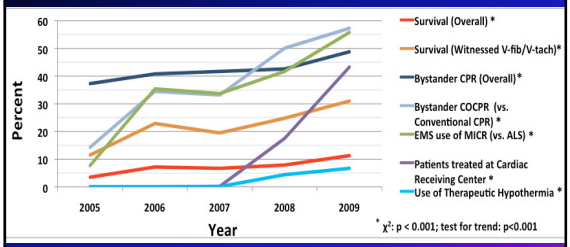

Transport to Designated Cardiac Arrest Center/ Cardiac Arrest Post Resuscitation
Inclusion Criteria
1. Non-traumatic OHCA with return of palpable central pulses or other evidence of spontaneous circulation
3. Transport to CAC when feasible, resources available, and will add less than 15 minutes to transport time compared to transport to non-CAC
5. Female patients not pregnant
6. No uncontrolled hemorrhage
7. No persistent unstable arrythmia
8. Patient does not appear to have severe environmental hypothermia related arrhythmia
9. No DNR paperwork identified during resuscitation
NO
Follow local/regional transport guidelines
YES
Notify receiving facility as soon as possible
Post resuscitation care
Control airway as necessary
Maintain ventilation rate of 8-10 breaths per minute
Consider anti-arrhythmic medication
If available administer 2000 mL cold (4°C/39.2°F) NS IV fluid bolus to the adult patient
Apply cold/ice packs to groin/axillae/neck
Consider dopamine for persistent hypotension


SHARE Cardiac Arrest Data Form


% Therapeutic Hypothermia System-Wide
% TH
30
25
20
15
10
5
0
8.4
28.8
Baseline
Post Recognition


Arctic Sun
DEFAULT 33 C
33.0C
Medivance CCU

Arizona
Annual OHCA Survival



SHARE - ReSS 2010

We now have > 600 OHCA survivors

Summary of 2010 Guidelines

- Many communities have improved survival from cardiac arrest.
- Too few victims of cardiac arrest receive bystander CPR.
- CPR quality by professional rescuers must be high.
- Frequent, brief refresher training is key to improving resuscitation performance.
- We must rededicate ourselves to improving the **frequency** of bystander CPR, the **quality** of all CPR and the **quality** of post–cardiac arrest care.

More Information

To view a copy of this presentation please go to www.heart.org/cprscience.

To learn more about upcoming products and information related to CPR and ECC visit www.heart.org/cpr.

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American Heart Association
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Thank you!